

## Claims

- [c1] 1. A handwritten numeral classifier using fuzzy logic and cellular neural network, comprising:
- an extraction unit using cellular neural network for receiving a scanned image having a plurality of input features, and compressing the received data of the scanned image to generate a plurality of feature values;
  - a membership function generator using fuzzy logic for storing a plurality of membership functions and receiving the feature values to generate a plurality of synthesis membership function degrees for the plurality of input features;
  - a k-WTA circuit for receiving the plurality of synthesis membership function degrees from the membership function generator and outputting the synthesis membership degrees in order of magnitude;
  - an I/O circuit for inputting programming codes to the membership function generator through off-chip memory units and receiving the synthesis membership degrees from the k-WTA circuit to output a final recognizing result of the scanned image; and
  - a clock generator and logic controller for generating clock cycle and control logic signals for controlling timing of and logic for operations of the extraction unit, membership function generator, and the k-WTA circuit.
- [c2] 2. The classifier in claim 1, wherein the I/O circuit and the k-WTA circuit both have 11 corresponding ports.
- [c3] 3. The classifier in claim 1, wherein the membership function generator further comprising:
- a membership function generator array respectively corresponding to each one of the plurality of the input features for storing the plurality of membership functions and generating a plurality of current-type membership function degrees for the plurality of the input features, and
  - a plurality of switched-current integrator corresponding to the membership function generator array for receiving the plurality of membership function degrees and generating a plurality of synthesis membership degrees.
- [c4] 4. The classifier in claim 3, wherein the membership function generator array is

10x10.

- [c5] 5. The classifier in claim 3, wherein the number of SI integrator includes 10.
- [c6] 6. The classifier in claim 5, wherein each of the plurality of SI integrators includes a plurality of storage units constructed by a RegulatedGate Cascade structure.
- [c7] 7. The extraction unit in claim 1, wherein the extraction unit further comprising:  
a connected components detector extractor with a cellular neural network structure for speedily extracting the input features of a scanned numeral image;  
and  
a compression unit for compressing bits of the input features into small and meaningful feature values and sending the compressed data to the membership function generator.
- [c8] 8. The classifier in claim 7, wherein the CCD extractor is 24 bits.
- [c9] 9. The classifier in claim 1, wherein the k-WTA circuit and the I/O circuit have 11 corresponding ports.